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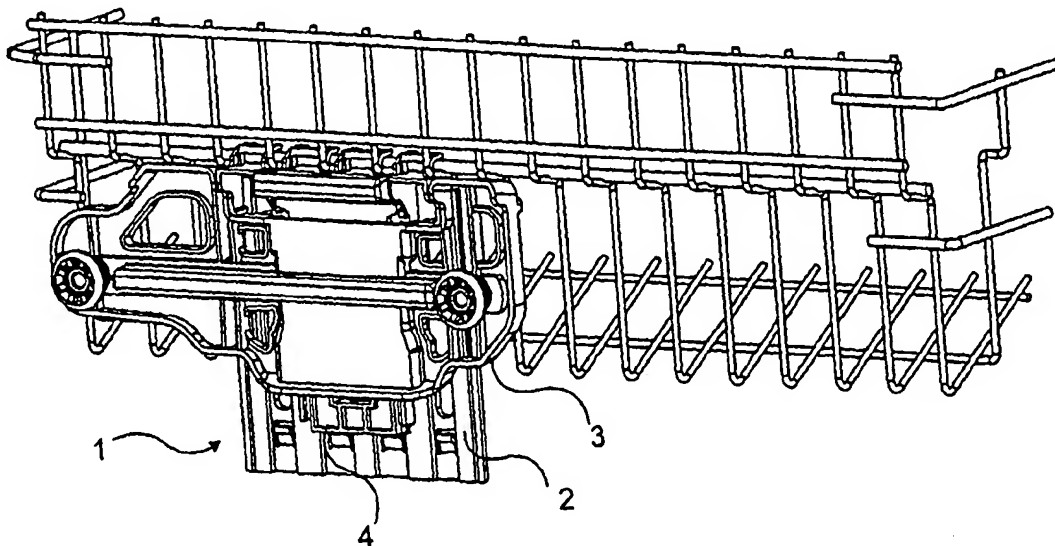
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(54) Title: VERTICAL ADJUSTMENT MECHANISM



(57) Abstract: The vertical adjustment mechanism (1) comprises a body (2), an unlocking lever (4) placed on said body (2), a locking mechanism (5) located between said body (2) and a supporting piece (3) on which the body (2) is attached and is located on both sides of the rack, opposite to each other. The unlocking lever (4) and the locking mechanism (5) are placed on the body (2) which in turn is attached on the supporting piece (3) to constitute the vertical adjustment mechanism (1). The vertical adjustment mechanism (1) placed on both sides of the rack when the user wants to move the rack upwards or downwards, she actuates the unlocking lever (4) and the locking mechanism by applying force on the locking lever (4) and as the result of this movement, the body (2) and the rack attached to said body (2) moves on the supporting piece (3).



*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## VERTICAL ADJUSTMENT MECHANISM

The present invention relates to the vertical adjustment of the dishwasher rack used in dishwashers.

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The dishwashers comprises a rail-wheel assembly attached onto the body, a rail moving between said rail-wheel assembly, wheels engaged in the rail, that is connected to the upper rack and a rail lid serving as a stopper to avoid the derailment of the upper rack. When the user wants to change the height of the rack, she opens the ray lid, disengages the rack from the rail and closes the rail lid  
10 after she places the other row of wheels provided on the upper rack, onto the rail. This procedure is relatively difficult for the user, particularly when the upper rack is not empty. Thus it can be realized only after said rack is emptied.

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In the German Patent No., DE 3025311 the system for the vertical adjustment of a rack when it is full, by a mechanism placed at both side of the said rack, without requiring the rail lid to be opened is depicted. Said mechanism comprises a support piece attached to the wires constituting the rack and a body providing the locking of said rack at a desired height while said supporting piece  
20 is moving. The user may raise or lower the rack by using said mechanism.

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In the European Patent Application No. 0925755 a vertical adjustment mechanism that can be used to elevate the material attached on it gradually, is disclosed.

The object of the present invention is to provide the adjustment of the dishwasher rack height inside the dishwasher cabinet.

The vertical adjustment mechanism realized to attain the object of the  
30 present invention has been illustrated in the attached drawings, wherein;

Figure 1, is the exploded perspective view showing the vertical adjustment mechanism from the front;

Figure 2, is the exploded perspective view showing the vertical adjustment mechanism from the back;

5        Figure 3, is the perspective view showing the vertical adjustment mechanism and the rack at the lower position;

Figure 4, is the perspective view showing the vertical adjustment mechanism and the rack at the upper position;

10       Figure 5, is the front view of the body and locking mechanism and the section view of the supporting piece, when the rack is at the upper position;

Figure 6, is the front view of the body and locking mechanism and the section view of the supporting piece, when the rack is at the upper position and when a force is applied on the unlocking lever;

15       Figure 7, is the front view of the body and locking mechanism and the section view of the supporting piece, when the rack is at the lower position.

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The components shown in the drawings are nummerated separately as listed below:

1. Vertical adjustment mechanism
- 20       2. Body
3. Supporting piece
4. Unlocking lever
5. Locking mechanism
6. Wheelwheel
- 25       7. Sliding guide
8. Guiding projection
9. Channel
10. Upper locking socket
11. Rack holder
- 30       12. 12a and 12b-Stopper
13. Rail

- 14. Socket
- 14a. Unlocking lever socket
- 14b. Lock socket
- 15. Slide guide projection
- 5 16. Groove
- 17. Bolt aperture
- 18. Unlocking lever frame
- 19. 19a and 19b, projection
- 20. Catch bar
- 10 21. Contact surface
- 22. Unlocking lever channel
- 23. Bolt projection
- 24. First bolt
- 25. Second bolt
- 15 26. Bolt angular surface
- 27. Spring secess
- 28. Spring
- 29. Supporting surface
- 30. End portion
- 20 31. Central portion
- 32. Barrier

The dishwasher contains lower and upper dishwasher racks wherein the material to be washed are placed. The distance between the lower-and upper-rack is determined by taking certain standards into consideration. When the upper rack is fixed, i.e. is stationary, various problems arise in placing the bulky materials such as pots and pans in the dishwasher. In order to eliminate such problems, the upper rack is mounted in such a manner that its position in the dishwasher and its height can be adjusted, and consequently materials of different sizes can easily be placed both in the upper and lower racks. One or more vertical adjustment mechanisms (1) preferably located on both sides of the upper rack are realized in

order to enable the customer to adjust the position of said rack and to fix it at different heights.

The vertical adjustment mechanism (1), comprises a body (2), an  
5 unlocking lever (4) placed on said body (2), a locking mechanism (5) located  
between said body (2) and the unlocking lever (4) and, a supporting piece (3) on  
which the body (2) is attached. Said vertical adjustment mechanism (1) is placed  
on both sides of the rack and when the user wants to move the rack upwards or  
downwards, she actuates the unlocking lever (4) and the locking mechanism (5)  
10 by applying force on the unlocking lever (4) and as the result of this movement,  
the body (2) and the rack attached to said body (2) moves on the supporting  
piece (3).

On the front surface of the supporting piece (3), a pair of wheels (6) and  
15 on its back surface, the sliding guides (7) facilitating the engagement of the body  
(2), one or more guide projections (8) between said sliding guides (7) and a  
channel (9) wherein the unlocking lever (4) moves between said guide  
projections (8), are provided. At the upper section of the channel (9) at least one  
upper locking socket (10) wherein the locking mechanism (5) is fitted and left  
20 locked, is provided. The channel (9) has such a structure that it narrows after the  
upper locking socket (10) and widens towards its end. The positioning of the  
sliding guide (7) and channel (9) on the supporting piece (3) is realized according  
to the center of gravity of the rack. The distance between sliding guides (7)  
located symmetrically on both sides of the supporting piece (3) is equal to the  
25 width of the body (2). The to-and fro-movement of the rack by the user is  
provided by the sliding movement of the wheels (6) placed on the rails in the dish  
washer.

The body (2) comprises one or more rack holders (11) preferably placed  
30 at the top, bottom and lateral sides of said body (2), one or more stoppers (12a),  
one or more rails (13), a socket (14) and one or more sliding guide projections

(15). The rack holders (11) enable the body (2) to be attached to the horizontal and/or longitudinal wires of the rack. Said stoppers (12a) that are located on the body (2), are so formed that they will not escape from the supporting piece (3) on which the body (2) is placed.

5

The sliding guide projections (15) provided on both sides of the body (2) are attached to the sliding guides (7) on the supporting piece (3). Furthermore, the body (2) is allowed to move easily without deviating from its movement direction, on the supporting piece (3) placed on the rails (13) by means of the guide projections (8).

10

The socket (14) on the body (2) comprises an unlocking lever socket (14a) wherein the unlocking lever (4) is placed and a locking socket (14b) wherein the locking mechanism (5) is placed.

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Projections (19a) provided at the inner sides of the unlocking lever socket (14a) to prevent the unlocking lever (4) from escaping out of its socket (14a). Said projections (19a) are preferably made in a cascading form, in order to minimize the movements of the unlocking lever (4) in its socket (14a). Stoppers (12a) that prevent the unlocking lever (4) from escaping, in vertical direction, from the body (2), are provided on the body (2), below the unlocking lever socket (14a). At the center of the unlocking lever socket (14a), a barrier (32) delimiting the horizontal movement of the unlocking lever (4), and extending along the unlocking lever socket (14a), is located.

20

Stoppers (12b) that prevent the locking mechanism (5) to release from the lock socket (14b) are provided at both ends of the lock socket (14b) and at places corresponding the recesses formed at the edges of the locking mechanism (5) of the lock socket (14b). The movement of the locking mechanism (5) is limited by the lateral wall of the lock socket (14b). Said lock socket (14b) is

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provided with one or more grooves (16) that allow the easy attachment of the locking mechanism (5).

The unlocking lever (4) comprises a bolt aperture (17), an unlocking lever frame (18), projections (19b), contact surfaces (21) preferably of an inclined structure, located at the lower section of the bolt aperture (17), an unlocking lever channel (22) to engage to the barrier (32) located at the center of the unlocking lever socket (14a) and a catch lever (20). The unlocking lever (4) moves in the direction of the force applied by the user, by means of the catch lever (20). Projections (19b) having the same cascade structure as the projections (19a) provided at the inner sides of the unlocking lever socket (14a), are provided at the edge of the unlocking lever frame (18), so that they (19b) are located under said projections (19a).

Locking mechanism (5) comprises a first bolt (24), a second bolt (25) and a spring (28) located between the first and second bolts (24,25). Said first and second bolts (24 and 25) comprise two portions, namely the end portion (30) and the central portion (31). The end portion (30) has a sloping surface that facilitates the movement of the locking mechanism (5) in the channel (9) provided on the supporting piece (3); whereas the central portion (31) has angular surfaces (26) to match with the contact surfaces (21) of the unlocking lever (4). A spring (28) that is contained in a spring recess (27) larger than the diameter of the spring (28) provided at the central portion (31) of the first bolt (24) is located between the first and second bolts (24 and 25). In the central portion (31) of the second bolt (25) placed as opposing the first lock handle (24), a supporting surface (29) is provided so that it enters the spring recess (27) on the first bolt (24). The spring recess (27) has a shape and size sufficient to contain said supporting surface (29). One or more bolt projections (23) are provided at the lower edge of the central portion (31) of both locking mechanisms (5). Said projections (23) fit into the grooves (16) provided at the lock socket (14b), during the assembly.



During the assembly of the rack vertical adjustment mechanism (1), the spring (28) is disposed in the spring recess (27) provided in the central portion (31) of the first bolt (24). Second bolt (25) is so placed in the spring recess (27) that the supporting surface (29) will be in contact with the spring (28). In this case, when a force greater than the spring (28) force is applied on the end portion (30) of the first and second bolts (24 and 25), they approach towards each other. Said first and second bolts (24,25) are brought close to each other and the spring (28) is compressed in order to place the locking mechanism (5) into the lock socket (14b) provided on the body (2). At this position, the distance between two bolt projections (23) provided at the bottom of the central portion (31) of the first and second bolts (24,25) is minimum and the locking mechanism (5) is attached in the lock socket (14b) by placing said bolt projections (23) in the grooves (16) provided at the lock socket (14b). To take said locking mechanism (5) out of the lock socket (14b), the spring (28) is compressed and the bolt projections (23) are removed from said grooves (16). At the moment when the locking mechanism (5) is fitted into the lock socket (14b), it is pushed by the spring (28) against the lateral walls of the lock socket (14b). Then, the unlocking lever (4) is placed into the unlocking lever socket (14a) provided on the body (2).

Said unlocking lever (4) is so placed on the barrier (32) extending along the unlocking lever socket (14a), that the projections (19b) at the edge of the unlocking lever frame (18) do not lap over the projections (19a) provided at the inner edges of the unlocking lever socket (14a). In order to place the unlocking lever (4) completely into the unlocking lever socket (14a) an upward force is applied on the unlocking lever (4) so that the unlocking lever (4) slides over the barrier (32), passes over the stopper (12a) and is received into the unlocking lever socket (14a). In this case, the projections (19b) on the unlocking lever (4) are positioned below the projections provided in the unlocking lever socket (14a) and the unlocking lever (4) is completely seated on the body (2) by means of two stoppers (12a) which rest against the lower surface of the unlocking lever frame (18). The movement of the unlocking arm (4) inside its socket (14a) is limited by

the stopper (12a), the grooves (16) provided below the lock socket (14b) and the lower surface of the bolt aperture (17).

Finally, the rack vertical adjustment mechanism (1) is completed by  
5 attaching the body (2) to which the unlocking arm (4) and locking mechanism (5) are incorporated, onto the sliding guides (7) provided on the supporting piece (3) by means of the sliding guides (15) provided on its both sides.

Said vertical adjustment mechanism (1) is fixed onto the rack by attaching  
10 the rack holders (11) provided on the body (2) to the horizontal and longitudinal wires of the rack. Preferably, said mechanism (1) is placed symmetrically on both sides of the rack: then, the wheels (6) provided on the supporting piece (3) are put onto the rails in the dishwasher and the rack is thus placed into the dishwasher.

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Said rack may be elevated by the user, applying a force onto the catch bar (20) provided at the upper section of the unlocking lever (4) or directly onto the rack.

20 When a force is directly applied on the rack, the body (2) with the rack attached on it, moves upwards in the supporting piece (3). During this movement, the channel (9) on the supporting piece (3), compresses the locking mechanism (5) provided on the body (2) due to its structure which first narrows then widens upwards. Consequently, the first bolt (24) is driven apart from the second bolt  
25 (25) when the channel widens and vice versa. When the rack reaches its uppermost level, the channel (9) widens again and the first and second bolts (24 and 25) move in the channel in opposite directions, by the force applied by the spring (28) compressed between said two bolts (24, 25). Consequently the locking mechanism (5) sits into the upper locking socket (10) located at the  
30 channel (9). In this case, the distance between the first and second bolts (24 and 25) is at maximum level and the rack remains fixed at this height.

While the rack is being raised by applying force onto the catch lever (20) provided at the upper side of the unlocking lever (4), as the results of said force, the unlocking lever (4) moves up inside the unlocking lever socket (14a), and simultaneously, the contact surfaces (21) on the unlocking lever (4) also move up, and bring the locking mechanism closer to each other by means of the angular surfaces (26) at the central portion (31) of the bolt, to which they contact. When said unlocking lever (4) is continued to be raised as long as it is pressed down after it rests against the body (2), said body (2) moves upwards inside the supporting piece (3). When the rack reaches the uppermost level, it is kept fixed and the locking mechanism (5) is fitted into the upper locking socket (10) by means of the spring (28) compressed after releasing the force applied on the unlocking lever (4), and which moves the first and second bolts. (24 and 25) in opposite directions within the lock socket (14b), (Fig. 5).

15

When the user wants to lower the rack, she applies a force onto the catch lever (20) provided at the upper section of the unlocking lever (4) (in direction A- Fig. 6). As the result of this force applied, said unlocking lever (4) moves up within the unlocking lever socket (14a). When the contact surfaces (21) at the lower side of the bolt aperture (17) move up, the spring (28) between the bolts is compressed and the first and second bolts (24 and 25) are brought close to each other by moving on the horizontal plane (in directions B and C, Fig. 6), by means of the angular surfaces (26) provided at the central portion of the bolt (24 or 25) to which they contact. At the end of this process, the first and second bolts (24 and 25) seated in the upper locking socket (10) when the rack was at the uppermost level, leave the socket (10) and the body (2) moves downwards, on the supporting piece (3).

While raising or lowering the rack, said rack can be raised/lowered as a whole by pulling simultaneously both unlocking levers (4) of the vertical adjustment mechanism (1) located at both sides of the rack, or first a part of the

rack can be raised/lowered by pulling one of the unlocking levers (4) and then the other a part of the rack can be raised/lowered by pulling the other unlocking lever (4).

- 5           Although one upper locking socket (10) is located on the supporting piece (3), in the above disclosed embodiments, more than one locking socket (10) may also be used in order to enable the rack to be kept at more than one level.

## CLAIMS

1. A vertical adjustment mechanism used in dishwashers, which is located on both sides of the rack, opposite to each other, and which comprises a body (2),  
5 an unlocking lever (4) placed on said body (2), a locking mechanism (5)) and a supporting piece (3) on which the body (2) is attached, enabling the rack to move by the movement of the body (2) on the supporting piece (3) when a force is applied on the unlocking lever (4) provided on the body (2) or is applied directly on the rack.  
10
2. A vertical adjustment mechanism as defined in Claim 1, characterized with the supporting piece (3) comprising, on its front surface, a pair of wheels (6) and on its back surface, the sliding guides (7) facilitating the engagement of the body (2), one or more guide projections (8) between said sliding guides  
15 (7), a channel (9) wherein the unlocking lever (4) and the locking mechanism (5) moves, between said guide projections (8), and at least one upper locking socket (10) wherein the locking mechanism (5) is fitted and left locked, and which enables the rack to move to-and-fro by the movement of the wheels (6) on the rails in the dishwasher.  
20
3. A vertical adjustment mechanism (1), as defined in Claims 1 and 2, characterized with the body (2) disposed on the supporting piece (3), that comprises rack holders (11) that enable the body (2) to be attached to the horizontal and/or longitudinal wires of the rack, a stopper (12a) preventing its  
25 escaping from the supporting piece (3) while moving on the supporting piece (3), sliding guide projections (15) attached to the sliding guides (7) on the supporting piece (3), rails (13) placed in the guide projections (8) on the supporting piece (3), allowing it to move easily without deviating from its movement direction, on the supporting piece (3), and a socket (14) including  
30 an unlocking lever socket (14a) wherein the unlocking lever (4) is placed and a locking socket (14b) wherein the locking mechanism (5) is placed.

4. A vertical adjustment mechanism (1), according to Claims 1 to 3, characterized with the socket (14) on the body (2) comprising an unlocking lever socket (14a) comprising projections (19a) to prevent the unlocking lever (4) from escaping out of its socket (14a) and at its center, a barrier (32) delimiting the horizontal movement of the unlocking lever (4), and a lock socket (14b) comprising stoppers (12b) that prevent the locking mechanism (5) to depart from the lock socket (14b) at both ends of the locking socket (14b) and at places corresponding the recesses formed at the edges of the locking mechanism (5) and grooves (16) that allow the easy attachment of the locking mechanism (5).
5. A vertical adjustment mechanism (1), according Claims 1-4, characterized with the unlocking lever (4), comprising a catch lever (20) on which force is applied, an unlocking lever frame (18) wherein the projections (19b) having the same cascade structure as the projections (19a) provided at the inner sides of the unlocking lever socket (14a), are provided, a bolt aperture (17) wherein contact surfaces (21) are located at the lower section of the bolt aperture (17), an unlocking lever channel (22) to engage to the barrier (32) extending along the center of the socket (14). located at the center of the unlocking lever socket (14a) placed an unlocking lever channel (22) to engage to the barrier (32) located at the center of the unlocking lever socket (14a)
6. A vertical adjustment mechanism (1), according to Claims 1-5, characterized with the locking mechanism (5) comprising a first bolt (24) comprising an end portion (30), a central portion (31), at said end portion (30) a sloping surface that facilitates the movement of the locking mechanism (5) in the channel (9) provided on the supporting piece (3) and at the central portion (31), one or more angular surfaces (26) , and a spring recess (27), a second bolt (25) in the central portion (31) of which, placed as opposing the first bolt (24), a supporting surface (29) is provided so that it enters the spring

recess (27) on the first bolt(24) and, a spring (28) placed in the spring recess (27) at the first bolt (24), connecting the first and second bolts (24 and 25) by resting against the supporting surface (29) at the central portion (31) of the second bolt(25).

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7. A vertical adjustment mechanism (1), according Claim 6, characterized with thi locking mechanism (5) comprising angular bolt surfaces (26) with the same form as the contact surfaces (21) provided at the lower section of the lock hand aperture (17).

10

8. A vertical adjustment mechanism (1), as defined in Claims 1 to 6, assembled by placing the locking mechanism (5) formed by the spring (28) placed between the first and second bolts (24, 25) in to the lock socket (14b) provided on the body (2), placing the unlocking lever (4) into the unlocking lever socket (14a) provided on the body (2) and attaching said body (2) with the unlocking lever (4) and the locking mechanism (5) onto the supporting piece (3); which provides the upwards movement of the body (2) in the channel (9) provided at the supporting piece (3), when the user intends to raise the rack, by applying a force on the catch lever (20) or on the rack, and keeps the rack fixed by engaging the locking mechanism (5) into the upper locking socket (10), and when the user desires to lower the rack, which provides the upwards movement of the unlocking lever (4) in the unlocking lever socket (14a) which in turn causes the locking mechanism (5) to leave the upper locking socket (10) and the body (2) to move downwards, in the channel (9) provided at the supporting piece.

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FIGURE 1

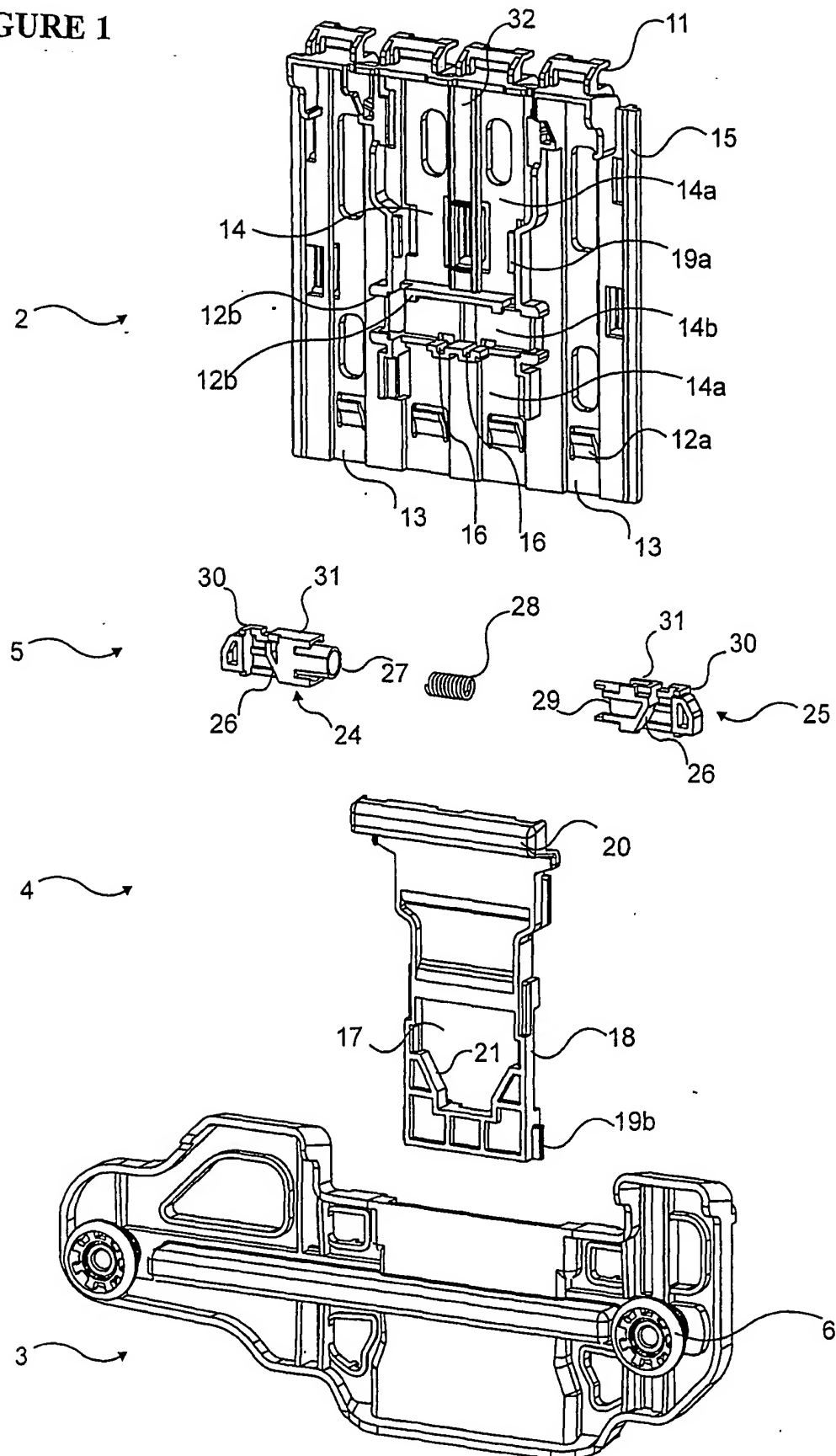




FIGURE 2

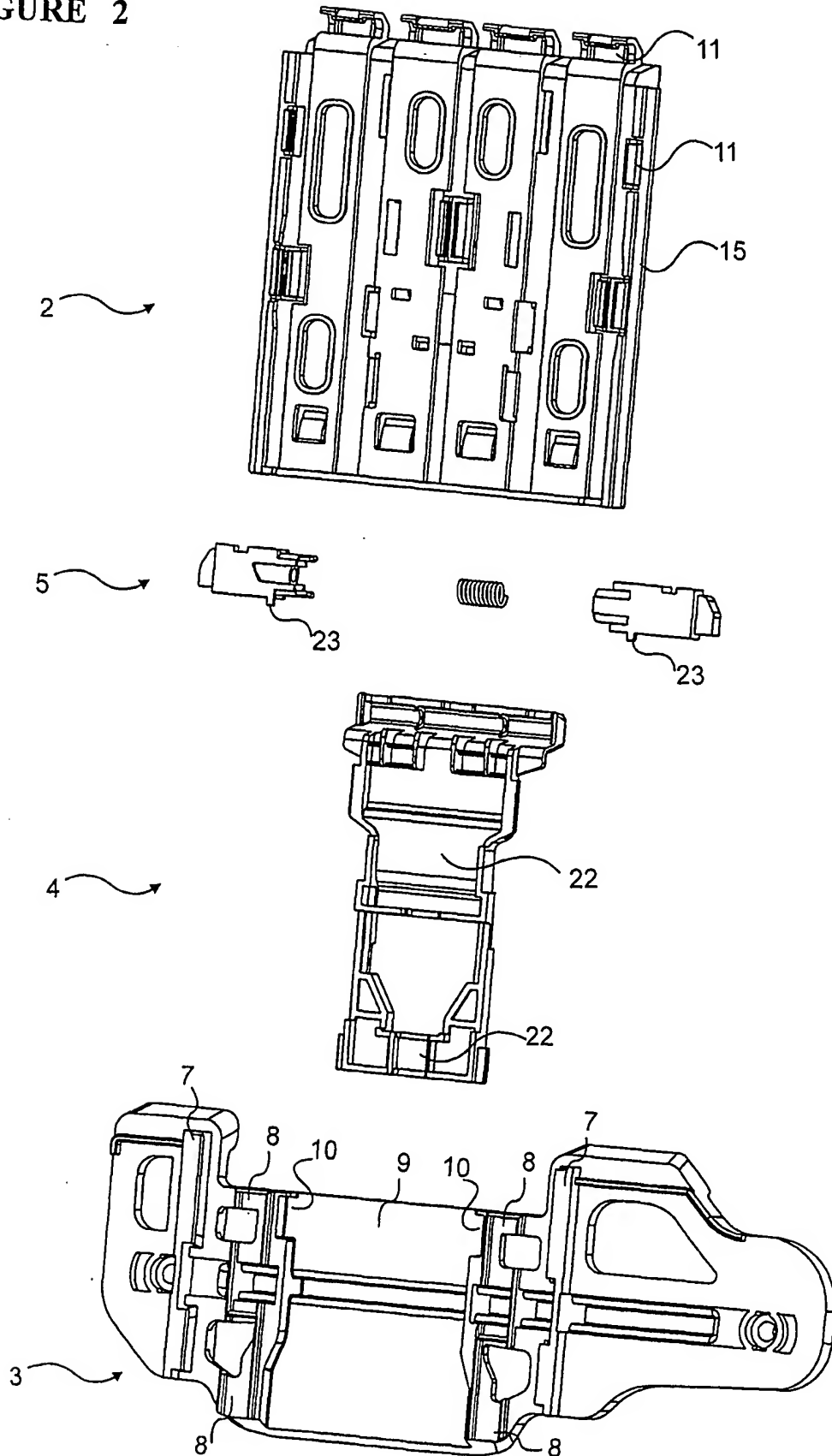


FIGURE 3

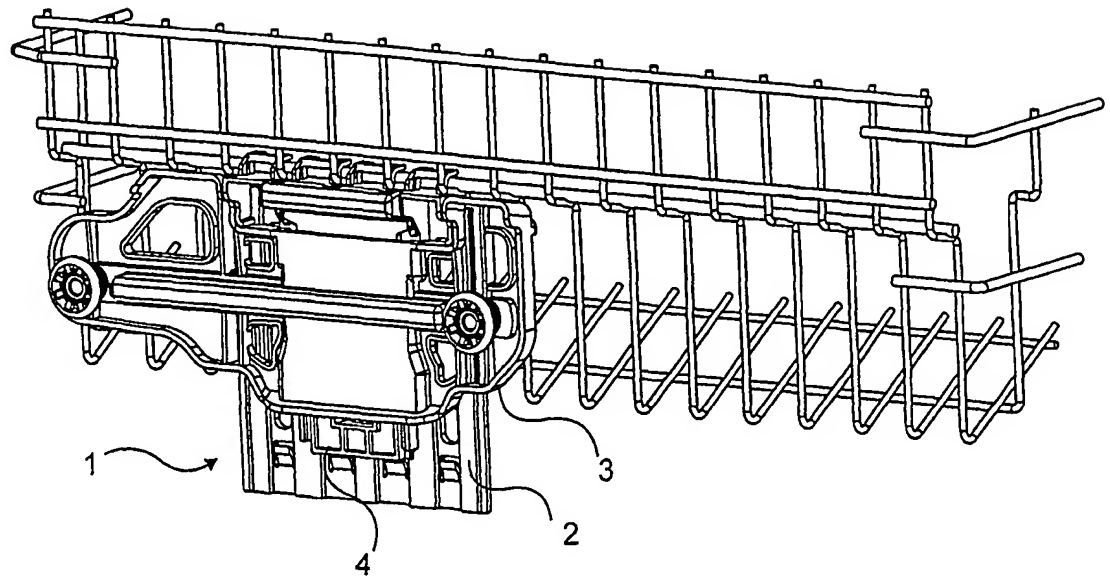


FIGURE 4

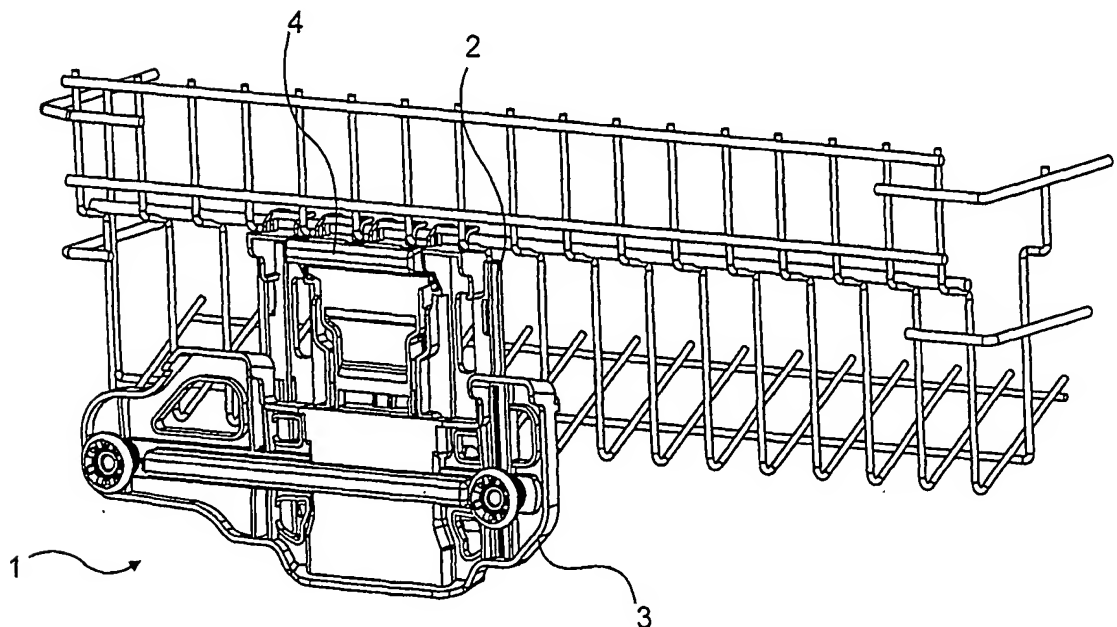


FIGURE 5

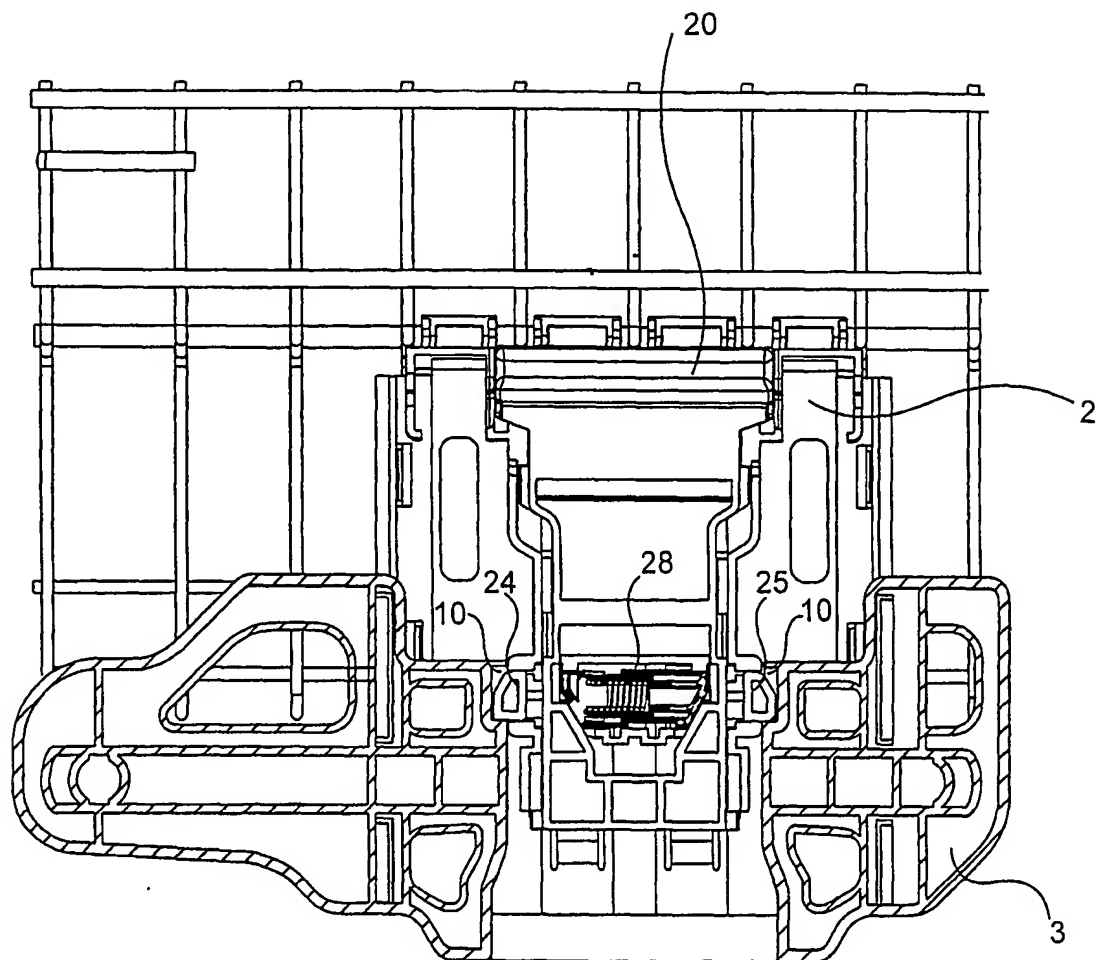


FIGURE 6

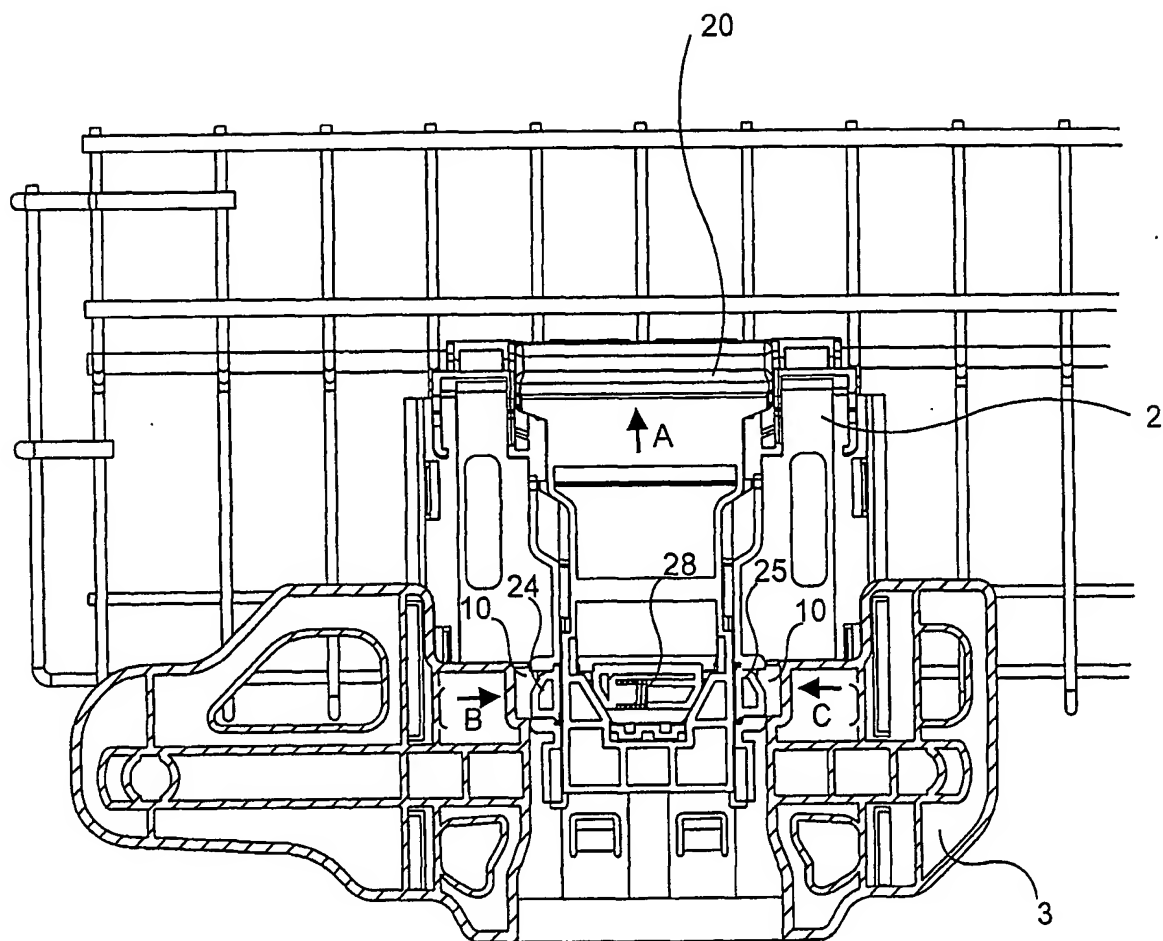
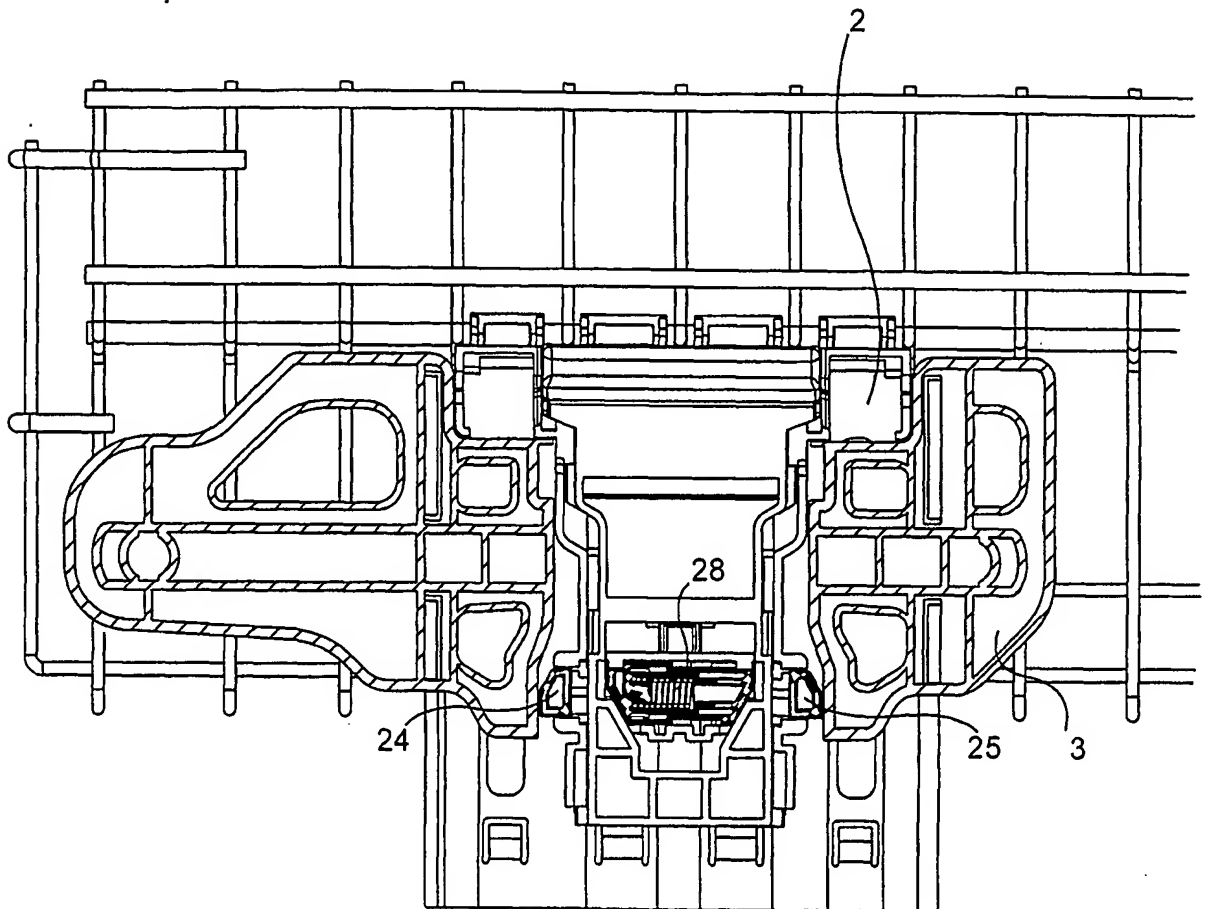


FIGURE 7



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/TR 01/00064

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 A47L15/50

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 033 483 A (EURO HAUSGERAETE GMBH) 12 August 1981 (1981-08-12) page 2, line 14 -page 3, line 33; figures 1,3	1-4
X	EP 0 848 930 A (SMEG SPA) 24 June 1998 (1998-06-24) column 2, line 46 -column 3, line 25; figures	1-3
X	US 5 860 716 A (GOOD ROBERT W ET AL) 19 January 1999 (1999-01-19) column 2, line 47 -column 3, line 35; figures 4,5	1,3
A	US 5 657 878 A (AUSTIN RONALD M) 19 August 1997 (1997-08-19)	

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

12 March 2002

Date of mailing of the international search report

25/03/2002

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# INTERNATIONAL SEARCH REPORT

International Application No

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